

Scientists without Borders

THE International Nuclear Safeguards and Engagement Program (INSEP) operated by the Department of Energy National Nuclear Security Administration (DOE/NNSA) supports international outreach akin to Doctors without Borders, the international organization that provides emergency medical treatments to people caught in disaster situations. Instead of offering medical aid, INSEP provides expertise on the peaceful uses of nuclear science and technology and nuclear infrastructure preparedness. Begun in the early 1980s as the Sister Laboratory Program, INSEP established cooperative institutional relationships between U.S. national laboratories and their counterparts in other nations. Today, the program seeks to assist cooperating nations in meeting the technical requirements associated with civilian nuclear power development in a manner that promotes international nonproliferation norms.

“The idea had its genesis in the Department of State and DOE as a way to engage with nonnuclear countries that had signed the Nuclear Non-Proliferation Treaty,” says Mo Bissani, who manages the sister laboratory activities in the Global Security Principal Directorate’s Nonproliferation Program. “Through bilateral cooperative arrangements, these activities establish direct lines of communication between nuclear specialists in the U.S. and those in the participating countries.”

A Program for Peace

The Treaty on the Non-Proliferation of Nuclear Weapons is part of a decades-long international effort to control the proliferation of nuclear weapons while making the peaceful use of nuclear technology widely available. Under the terms of this treaty, the five acknowledged nuclear weapon states—the U.S., U.S.S.R., United Kingdom, France, and China—agreed not to transfer nuclear weapons, other nuclear explosive devices, or related technology to



Lawrence Livermore is one of five U.S. national laboratories participating in the International Nuclear Safeguards and Engagement Program. The U.S. has signed arrangements with 10 countries (blue dots). An arrangement with Malaysia (green dot) is being negotiated.

the signatory states with no nuclear weapons. The five nations also pledged to work toward eventual elimination of their own nuclear stockpiles. The signatory nonnuclear states, in turn, agreed not to acquire or produce nuclear weapons or nuclear explosive devices. In exchange, these states would have access to peaceful nuclear technologies for such applications as energy generation, medical use, and research.

The International Atomic Energy Agency (IAEA) oversees the primary multilateral methods for helping the nonnuclear countries use these technologies through its Technical Cooperation Programme. One way the U.S. provides technical cooperation is through INSEP. “Nuclear energy is bound to play an increasing role in the future as oil reserves are depleted—even in countries that export oil,” says Bissani. “Countries must have the information and technical expertise they need to make this a safe, secure, and successful endeavor.”

INSEP addresses the growing interest in nuclear energy in several ways. Assistance in nuclear safeguards helps participating countries meet international standards for nuclear material

accounting and control. Nuclear infrastructure preparedness assistance provides them with the technical capabilities to develop nuclear power safely and securely while meeting international norms and requirements. Specific topics for cooperation include radiation protection, reactor operations, and radioactive waste disposition.

Through INSEP, scientists from Lawrence Livermore and other national laboratories work with their international counterparts, exchanging information on subjects ranging from radiation protection and health physics to radioactive waste management, research reactor optimization, radioisotope production, neutron activation, and emergency response protocols. “At Livermore, we have decades of experience that we can share with our counterparts across the world,” says Bissani, “and we are happy to pass this expertise on to others.”

Mexico was the first beneficiary of the nuclear engagement program. In 1982, its National Institute of Nuclear Research was paired with Los Alamos National Laboratory. Today, the list of participating countries includes Algeria, Argentina, Egypt, Libya, Morocco, Peru, Romania, Thailand, and Vietnam. Five national laboratories participate: Lawrence Livermore, Los Alamos, Sandia, Oak Ridge, and Argonne. Universities such as the University of Texas at Austin, University of California at Davis, Texas A&M University, Massachusetts Institute of Technology, and University of Missouri also contribute.

Livermore leads collaborations with the North African region, which includes Algeria, Egypt, Libya, and Morocco. “The program

started with exclusive laboratory-to-laboratory links,” says Bissani. “Since then, NNSA has restructured it so that people can be pulled from any participating laboratory or university. That way, the best experts are assigned to each collaboration.”

INSEP offers unclassified technical assistance at different levels. Once a bilateral arrangement is signed, U.S. researchers meet with a facility’s scientists and engineers to develop action sheets that outline the scope of a specific project, its schedule and tasks, and the roles and responsibilities for all participants. “When the action sheets are signed, we send experts from Livermore and other organizations on a brief expert mission,” says Bissani. “These people stay in the host country for a week or so, where they provide hands-on training, attend seminars, and give presentations on the subject.”

In 2002, for example, Livermore researchers traveled to Morocco for an expert mission with researchers at the Moroccan National Center for Nuclear Energy Sciences and Techniques. The Moroccan equivalent to a U.S. national laboratory, the center operates the newly constructed research reactor at the Nuclear



At left, two scientists from Morocco receive training on nuclear reactor safety from a colleague at the University of Texas at Austin. Above, Livermore scientist Paris Althouse (background) demonstrates a sampling technique used for a baseline characterization project in Morocco.

Members of the U.S. delegation working with Libya's Tajura Nuclear Research Center are (from left) Mary Ann Parker, Population Services International; Chris Eves, U.S. Embassy in Libya; Greg Jones, Livermore; Maggie Manning, Department of Energy (DOE); Dewey Sprague and Mo Bissani, Livermore; and Ken Apt, DOE.



Research Center in Maamora. Built to international nuclear safety standards, the research reactor will be used for such civilian purposes as basic science and research, industrial applications, and medical isotope production. It will also lay the groundwork for nuclear-generated electrical power, should Morocco choose to develop this energy source.

On the 2002 trip, the Livermore team analyzed environmental samples to characterize the background, or baseline, of nonradiological constituents in various media at the Maamora facility. Samples included surface soil and water, groundwater from underground wells, short-lived vegetation such as grass, and long-lived vegetation such as oak trees. At the time of sampling, most of the buildings and laboratories had been built, but no construction activities had begun in the area zoned for the research reactor.

Action sheets may also specify a hands-on activity that can only be supplied in the U.S., such as training personnel on reactor

operations. For these projects, the program authorizes scientists from the foreign facility to visit the U.S. for up to two months, depending on funding availability. Livermore also leverages its resources by using IAEA fellowships to meet some of the training requirements.

"We complement the IAEA program," says Bissani, "we don't compete with it." For instance, IAEA fellowships supported three researchers traveling to Livermore from Morocco. One scientist stayed more than four months to study Lawrence Livermore's approach to nuclear waste characterization, sampling, treatment, and disposal. A second Moroccan researcher focused on nuclear chemistry, and a third learned about techniques for managing nuclear waste.

Another approach to international cooperation is to provide regional training through workshops and seminars. "We often send our experts into a country to conduct a workshop and invite scientists in nearby countries to participate," says Bissani.

“When our team led a workshop at the Egyptian Atomic Energy Authority in Cairo on neutron and prompt gamma activation analyses, we also invited our colleagues from Algeria, Libya, and Morocco.” Conducting workshops in a participating country instead of in the U.S. often makes travel and other logistics easier for the attendees.

The NNSA program can also facilitate material exchanges of goods and equipment between a U.S. laboratory and a participating facility. For example, researchers can arrange to transfer samples, materials, and components to their counterpart laboratories or help them acquire reference materials and difficult-to-obtain items, such as radiation monitoring and waste treatment equipment.

Partnership with Libya

In 2005, the U.S. and Libya signed an agreement for cooperation focusing on the Tajura Nuclear Research Center. Action sheets define interactions between the parties in the areas of reactor operation, radiation protection and health physics, neutron activation analysis, environmental safety and health, quality assurance, and radioactive waste management.

Livermore health physicists Greg Jones and Dewey Sprague have traveled to Libya several times in the past two years on behalf of the agreement. The Tajura reactor originally used highly enriched uranium fuel. Through DOE’s Global Threat Reduction Initiative, it has been converted to low-enrichment uranium fuel, which is preferred for meeting nonproliferation goals.

“They restarted the reactor with the new fuel in April 2007,” says Jones. “The whole process is like putting a new engine in a car. You go slowly and test the system before you take it up to speed. We offer our technical expertise and train personnel, for example, showing them how to safely handle fuel elements during refueling. Some of their instruments and monitoring systems are 27 years old—the age of the original reactor—and they want to upgrade this equipment as well.”

Livermore is also assisting Libya in such areas as basic radiation monitoring, contamination control, and surveying. The Tajura facility recently upgraded from a film dosimetry system to a thermoluminescent system, and Jones and Sprague helped their colleagues calibrate the more modern dosimetry reader. “The two countries have similar regulatory systems in place,” says Jones, “but the regulations and legal limits differ. We tailor our training materials to their systems and listen to what they say they need. It’s exciting to make the connections. The program’s success depends on building trust among the participants.”

Sprague, who leads the radiation protection activities with Libya, adds that participants must be open to different cultures and philosophies. “Things move differently in Libya than in the U.S.,

which is true of many Mediterranean countries,” he says. “Anyone taking on this sort of work must be considerate of the differences between our cultures.”

Participating in the program requires stamina as well as diplomacy. “We spend weeks preparing for a one-week mission,” says Sprague. “Libya is 10 time zones ahead of California, and traveling there requires two days. The U.S. delegation must hit the ground running, often launching into a full day of meetings and presentations. We’re prepared to work 10 to 14 hours a day, doing everything we can to ensure a positive outcome.”

Cooperation Opens Doors

Developing good relationships is the key to INSEP’s success, and each relationship is unique. “First, we build trust at the highest level,” says Bissani. “Then we get the technical experts of both sides involved. We know we’ve succeeded when a problem crops up and our counterparts call to ask for our assistance and guidance. The Livermore people who participate do so with passion and derive great satisfaction from their work.”

In June 2007, the U.S. signed an arrangement with Algeria to cooperate at the laboratory-to-laboratory level on peaceful uses of nuclear energy. “Algerian scientists and engineers are excited about this opportunity,” says Bissani. “It was front-page news in the Algerian media. The arrangement will provide an important mechanism to establish meaningful cooperation aimed at real technical issues. In the near future, we will send a technical team to Algeria to do what we do best: provide training and consultations, help solve technical problems, and collaborate on technical activities related to the peaceful uses of nuclear applications.”

In January 2008, INSEP plans a regional conference at Livermore for colleagues from the national nuclear laboratories in North Africa and the Middle East. “Our goal is to support nascent interest in nuclear power development consistent with nonproliferation and national security objectives in North Africa,” says Bissani. “We also want to strengthen the relationship between NNSA and participating countries—each of which is considering the introduction of nuclear power—while laying a foundation for increased cooperation, bilaterally and regionally, in the future.”

—Ann Parker

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